

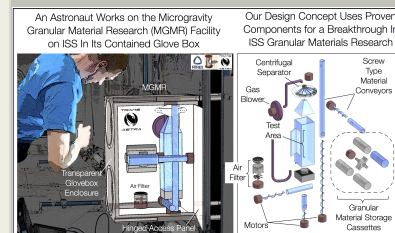
Microgravity Granular Material Research (MGMR) Facility for ISS, Phase I

Completed Technology Project (2017 - 2017)



Project Introduction

TransAstra Corporation in collaboration with Grainflow Dynamics Inc. and the Colorado School of Mines proposes to develop a general purpose Micro-g Granular Material Research (MGMR) facility for use on the ISS. This facility will include a test section into which third party experimenters can place their apparatus and will be suitable for studying steady or variable gas-solid flows over a 2-orders of magnitude range in particle size and 4-orders of magnitude in solids-fraction at gas pressures ranging from atmospheric to vacuum and flow velocities from a 10s of m/s per second down to stationary conditions. This facility will provide a unique opportunity to gain understanding of the fundamental physical behavior of granular solids in microgravity over a range of solids fractions that are unobtainable terrestrially due to gravitationally induced settling. It will also support study of phenomena occurring in static assemblies of solid particulates and in pneumatic transport. MGMR will support exploration of static, transient, and steady-state flow conditions. In microgravity, low speed pneumatic transport can cause aggregation of particles resulting in the formation of gel-like structures which grow to fill available volumes. Such fractal-lattice particulate-gels are a potential blocking mechanism that could affect low-velocity pneumatic transport in human habitation systems and/or ISRU operations on asteroids or other small bodies such as the moons of Mars. Understanding what contributes to the strength of such gels and developing the means to avoid or disrupt them will be crucial for the design of solids transport systems in future ISRU facilities. The MGMR will provide a unique environment for advancement of both fundamental science and of technologies important for the advancement of solar system exploration. The MGMR will also serve as a subscale testbed for the fabrication of radiation shields made from asteroid regolith for human deep space habitats.



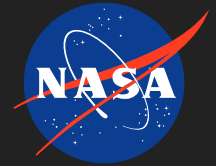
Microgravity Granular Material Research (MGMR) Facility for ISS, Phase I Briefing Chart Image

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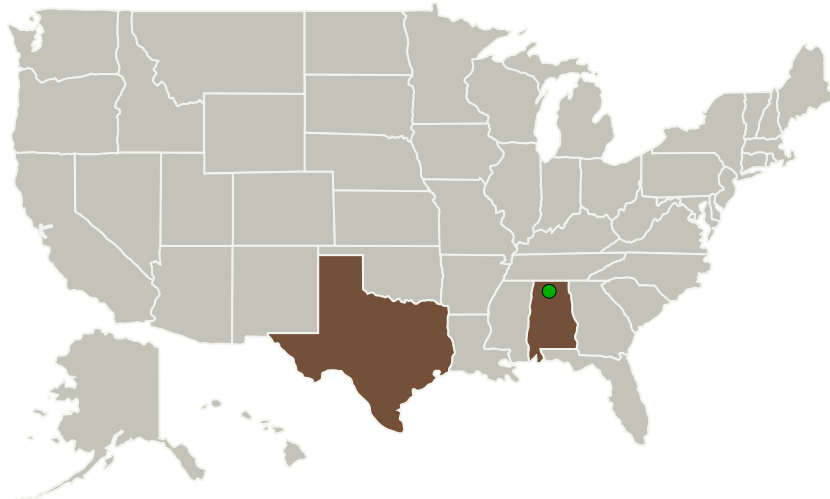
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Trans Astronautica Corporation	Lead Organization	Industry Small Disadvantaged Business (SDB)	Houston, Texas
● Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	Texas
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Trans Astronautica Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

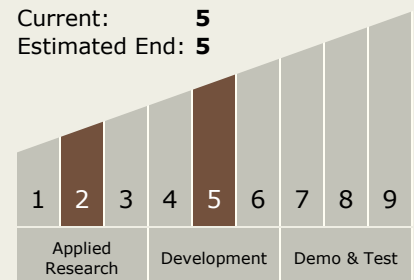
Carlos Torrez

Principal Investigator:

Joel Sercel

Technology Maturity (TRL)

Start: 2
Current: 5
Estimated End: 5

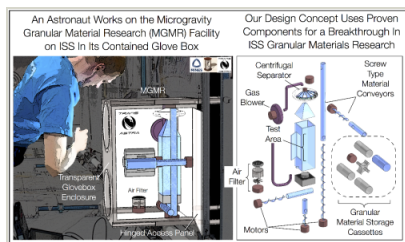


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Images



Briefing Chart Image

Microgravity Granular Material
Research (MGMR) Facility for ISS,
Phase I Briefing Chart Image
(<https://techport.nasa.gov/image/126030>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.7 Special Materials

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System